Notice No.1

for the

Code for Offshore Personnel Transfer Systems, July 2021

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note for the corrigenda items paragraphs, Tables and Figures are not shown in their entirety.

Issue date: November 2021

Amendments to	Effective date	IACS/IMO implementation (if applicable)
Chapter 1, Sections 1 – 5, 7 - 14	Corrigenda	NA
Chapter 2, Sections 3, 4 & 5	Corrigenda	NA

Lloyd's Register

Chapter 1
Code for Offshore Personnel Transfer Systems

■ *Section 1*
General

1.1 Introduction

Table 1.1.1 Operational and functional sequence of a typical motion compensated OPTS

Operational step	Service condition	Persons on gangway	Functional/operational description
17	In-service	Possible	~~Personnel are~~ The transferring personnel is leaving the OPTS via the waiting area or via the gangway.

1.2 Scope

1.2.5 In order for this Code to be applicable it is required that the ships and/or floating units and/or offshore units are moored or a Dynamic Positioning System or a Positional Mooring System is installed on the mothership supporting the OPTS or which is served by the OPTS. The capability and performance of the position keeping system and its reference systems are to be taken into account and are to ensure safe operation of the OPTS in all environmental conditions for which the personnel transfer system is designed. The requirement for the installation of position keeping systems will be specially considered in case of small vessels or other circumstances (e.g. low operational significant waves heights) where such systems may be unreasonable or may not be applicable.

1.3 Stakeholders

1.3.1 This Code is considered relevant to the following stakeholders:
(d) Lloyd's Register plan appraisal ~~specialists~~ Specialists.

1.4 Prerequisites

1.4.2 These requirements are framed on the understanding that:
(h) The manufacturer is to have a documented quality assurance system in place (including a continuous improvement system) in compliance with a recognised National or International Standard, e.g. ISO 9001 *Quality management systems – Requirements*. For further details *see Ch 1, 11 Quality assurance system*.

1.6 Classification procedure

1.6.3 The standard procedure for classification is given in *Ch 1, 1.3 Classification ~~1.3.6~~ 1.3.5* and *Table 13.3.1 Minimum requirements for the classification of lifting appliances* of the *Code for Lifting Appliances in a Marine Environment*.

1.7 Certification procedure

1.7.1 Where certification, which is distinct from classification, of the OPTS is requested, the procedures to be adopted are the same as those for classification outlined in Ch 1, 1.6 Classification procedure, with the following exceptions:
(a) The required documentation for the materials used ~~is to~~ may comply with *Ch 1, 12.8 Documentation 12.8.3*.

1.8 Class notations

1.8.1 If the OPTS forms an essential feature of the mothership, the mandatory class notation ~~LA~~ **LA** shall be applied.

1.8.2 The special feature class notation which may optionally be applied to OPTS is defined as ~~W2W~~ **W2W**.

1.9 Referenced Rules, Codes and Standards

1.9.1 The authority requirements and the requirements of Codes, Rules and Standards listed in the following are to be applied in the following order of priority:
(b) The requirements of this ~~Code for OPTS~~ *Code for Offshore Personnel Transfer Systems*.

1.9.4 Lloyd's Register Rules, Codes and Procedures;
(f) ShipRight Procedure ~~*Linked Supporting Services, Procedure for the Assessment of*~~ *Cyber Security for Ships and Ships Systems*,
(g) ShipRight Procedure ~~*Design and Construction, Additional Design Procedures, Risk Based Designs (RBD)*~~ *Risk Based Certification (RBC)*.

All instances of Risk Based Design (RBD) have been replaced with Risk Based Certification (RBC) throughout this Ruleset.

1.9.6 International Standards:
(c) ISO 898 *Mechanical properties of fasteners made of carbon steel and alloy steel,*

(d) ISO 15138 *Petroleum and natural gas industries – Offshore production installations – Heating, ventilation and air-conditioning*,
Existing entries (d) to (av) have been renumbered (e) to (aw).
(aw) IEC 61892-7 *Mobile and fixed offshore units – electrical installations – Part 7: Hazardous areas,*
(ax) IEC 62443 *Security for industrial automation and control systems*,
Existing listed items (aw) and (ax) have been renumbered (ay) to (az).
(ba) ISO/IEC 27001 *Information technology – Security techniques – Information security management systems – Requirements*,
Existing listed items (ay) to (bg) have been renumbered (bb) to (bj).
(bk) ANSI/ISEA 121 *American National Standard for Dropped Object Prevention Solutions,*
~~(bh)~~ (bl) API RP 505 Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2.

1.10 Terms and definitions

1.10.11 **Failure load** is the load when a structural member, component or other part of the OPTS has just reached its load bearing capacity and any further increase of the load will result in, e.g.:

1.10.25 **Manufacturer's certificate** is defined as a certificate issued by the manufacturer based on the results of testing and inspection being satisfactorily carried out in accordance with the requirements of ~~these Rules~~ the *Rules for the Manufacture, Testing and Certification of Materials,* or the applicable National or International Standard. The certificate is to be validated by the manufacturer's authorised representative, independent of the manufacturing department. The certificate will contain a declaration that the products are in compliance with the requirements of these Rules or the applicable National or International Standard. This certificate is equivalent to an inspection certificate EN 10204 *Metallic products – Types of inspection documents*, 3.1 (or ISO 10474 *Steel and steel products – Inspection documents*, 3.1) issued by the manufacturer of the materials.

1.10.27 **Motion compensation** is the ability of the OPTS to fully or partly limit the translational and rotational motion effects of the moving mothership, i.e. dynamic: roll, pitch, yaw, heave, sway and surge, and static: heel~~,~~ and trim.

1.10.29 **Off-board lift** is defined as ~~an~~ a lifting operation which is not limited to the mothership usually taking place over the side of the mothership.

1.10.32 **On-board (internal) lift** is defined as ~~an~~ a lifting operation which is limited to the mothership the appliance is installed on.

1.10.35 **Personnel** are the persons which are using the OPTS as a means to safely move/transfer between the mothership and the target unit.

~~1.10.38~~ 1.10.5 **Critical non-structural component** is a component of the OPTS where the failure of which may or will result in the loss of functionality or complete loss of the OPTS, e.g. control system, control panel.

1.10.54 **~~Uniform Design~~ Uniformly Distributed Load – Personnel (*UDL_P*)**. The ~~uniform design~~ uniformly distributed load, *UDL_P*, is related to the transfer of personnel and is specifically defined as the distributed load per area which comprises of the weight of the maximum possible number of personnel simultaneously and safely using the OPTS including applicable equipment.

1.11 Abbreviations

1.11.33 **UDL**
~~Uniform Design~~ Uniformly Distributed Load

1.12 Information to be submitted

1.12.4 Detailed specification of the OPTS and design basis of the OPTS including:
(f) Safe Working Loads or ~~Uniform Design~~ Uniformly Distributed Loads applicable to the OPTS (*see Ch 1, 3.3 Safe Working Load* and *Ch 1, 3.4 ~~Uniform design~~ Uniformly Distributed load*);

1.12.27 Information about the type of consideration and the possible review or appraisal status codes of the submitted documents are provided in *Table 1.1.2 Type of consideration and review/appraisal status*.

■ *Section 2*
Offshore Personnel Transfer System types

2.2 System types

2.2.1 ~~ST-A~~ **ST-A** system types which provide a permanent active compensation may be described as systems where:

2.2.2 ~~ST-P~~ **ST-P** system types which provide a passive compensation may be described as systems where:

2.2.3 ~~ST-H~~ **ST-H** system types are defined as hybrid systems in cases where a combination of passive (~~ST-P~~ **ST-P**) and active (~~ST-A~~ **ST-A**) systems is used and where:

2.2.4 ~~ST-C~~ **ST-C** system types combine the personnel transfer capability (using the gangway as a conventional jib) with a dedicated cargo handling capability (e.g. using hoisting falls and a winch) and are also required to be designed as a conventional offshore crane complying with all relevant requirements.

2.2.5 ~~ST-A~~ **ST-A** and ~~ST-H~~ **ST-H** system types may combine personnel transfer capability with cargo transfer capability where the cargo is stored in dedicated cargo baskets at the tip of the gangway.

2.2.6 ~~ST-M~~ **ST-M** system types combine the personnel transfer capability (using the gangway as a conventional jib) with the personnel handling capability (using falls and a winch). In such cases the system is also required to be designed as an offshore crane with handling of personnel capability complying with all relevant requirements.

2.2.7 There may be combinations of the above defined systems types, e.g. ~~ST-HM~~ **ST-HM** which defines a hybrid type system with crane cargo handling and personnel handling capability.

2.3 Access types

2.3.1 Three types of access systems are defined for the purposes of this Code:
(c) **A-BPC**
OPTS which transfer personnel in a personnel containment (e.g. basket, platform, or other type of containment) designed for that purpose are abbreviated as A-PC. For a definition of personnel containment reference is made to *Ch 1, 1.10 Terms and definitions 1.10.36*.

■ *Section 3*
Loads and factors

3.1 General

Figure 1.3.1 Examples of principal loads acting on an OPTS
*UDL*P = Personnel ~~Uniform Design~~ Uniformly Distributed Load

3.1.8 During normal offshore personnel transfer operations, the system shall be subjected to the following loads which are to be considered as a minimum:
(f) inertia loads due to mothership accelerations (vertical and horizontal) acting on the ~~ST-P~~ **ST-P** system type OPTS and its SWL_P, UDL_P and SWL_{CG};
(g) inertia forces due to accelerations caused by the compensation system (e.g. due to residual accelerations caused by not fully effective motion compensation) for ~~ST-A~~ **ST-A** and ~~ST-H~~ **ST-H** system type OPTS ~~types~~;

3.4 ~~Uniform design load~~ Uniformly Distributed Load

3.4.2 The ~~uniform design load~~ uniformly Distributed Load, UDL_P, is to be taken as:
UDL_P =360 kg/m²

3.4.4 The above ~~uniform design load~~ uniformly Distributed Load, UDL_P, is to be enhanced by the applicable risk coefficient as defined in *Ch 1, 3.8 Risk coefficient*.

3.7 Loads on handrails

3.7.1 Handrails and their supporting structure (e.g. guard-rails and stanchions) shall be designed to a minimum distributed load of ~~51 kg/m²~~ 51 kg/m without permanent deformation. This distributed load may be increased by the mothership accelerations and loads from motions of the OPTS. The inclinations of the mothership shall also be taken into consideration.

3.11 Mothership motions and accelerations

3.11.4 Where sinusoidal motions are used to establish design accelerations, the maximum and residual acceleration calculations should be made for a range of likely motion periods. Where random motions are used to establish design accelerations, the maximum acceleration a_{max} shall be taken as 3,72 times the RMS acceleration, i.e.:

$$a_{max} = max\begin{Bmatrix} |a_{mean} + 3{,}72\ a_{RMS}| \\ |a_{mean} - 3{,}72\ a_{RMS}| \end{Bmatrix}.$$

If time domain simulation is used, the RMS accelerations shall be established over at least 10 minutes full scale simulation time.

3.14 Wind

3.14.2 The following design wind speeds shall be applied, as a minimum:
(a) In-service operation: $v_{\text{In-service}} = 20\,\text{m/s}$ ~~= 20 m/s~~^{2}
(b) Out-of-service: $v_{\text{Out-of-service}} = 63\,\text{m/s}$ ~~= 63 m/s~~^{2}

3.16 Emergency scenarios and loads

3.16.3 Examples for such scenarios are given, but shall not be limited to the following:
(m) Consideration of the 'double angle effect', where the OPTS motion compensation system might have stopped operating due to a failure or due to an emergency stop activation in an unfavourable moment resulting in potentially twice the design mothership inclination the OPTS has been designed for.

3.16.5 For ~~ST-A~~ **ST-A** and ~~ST-H~~ **ST-H** system types OPTS ~~types~~, the design analysis in an emergency case of compensation system failure shall cover all the loads specified in *Ch 1, 3.1 General 3.1.8*, however, the inertia loads due to the mothership accelerations acting on the OPTS dead load and its SWL_P, UDL_P and SWL_{CG} shall be taken as full accelerations without compensation.

13.19 Design loads for components

3.19.2 The following components have the potential to be considered for their own design loads, e.g.:

■ *Section 4*
Load cases and load combinations

4.2 Operational load combinations

4.2.2 Load combination cases ~~Load combinations~~.

4.3 General transit/voyage (stowage/survival) and in-field transit load combinations

4.3.2 Load combination case ~~Load combination~~.

4.4 In-service and out-of-service emergency/exceptional load combinations

4.4.1 The following in-service and out-of-service emergency and exceptional scenarios, loads and load combinations shall be taken into consideration as a minimum and are associated with load combination Case 4, such as:
(i) 'redundancy situations' (e.g. failure of one hydraulic cylinder in a two hydraulic cylinder design ~~failure~~).

4.4.2 ~~Load case~~ Load combination cases.

4.5 Load combination overview

4.5.1 *Table 1.4.1 Conditions, configurations, effects and load types* provides an overview of what conditions/configurations, effects and loads are to be considered in which load combination case. Further details can be found in *Ch 1, 4.2 Operational load combinations*, *Ch 1, 4.3 General transit/voyage (stowage/survival) and in-field transit load combinations* and *Ch 1, 4.4 In-service and out-of-service emergency/exceptional load combinations*.

Table 1.4.1 Conditions, configurations, effects and load types
Note *13*: *See Ch 1, 3.16 Emergency scenarios and loads, Ch 1, 10 Risk assessment* and *Ch 1, 3.22 Special loads*.

4.7 Load case combinations

4.7.1 The combinations of loads and load combination cases are given in *Table 1.4.1 Conditions, configurations, effects and load types*. The combinations given shall be used even if the concept of load and resistance factor design is not applied.

4.8 Offshore cranes

4.8.1 If the OPTS is also used as a conventional offshore crane and/or ~~handing~~ handling of personnel in a personnel containment, then the loads and load combinations of the *Code for Lifting Appliances in a Marine Environment* for offshore cranes are to be taken into consideration. *See Ch 4, 3 Offshore cranes* of the *Code for Lifting Appliances in a Marine Environment*.

Section 5
Allowable stresses and safety factors

5.1 General

5.1.2 As an alternative to the allowable stress design method as given in this Section, the concept of load and resistance factor design may be applied. *See Ch 1, 4.6 Stress factors 4.6.2* and *Table 1.4.1 Conditions, configurations, effects and load types*. The application of the concept is in general to be carried out as per the requirements of National or International Standards, such as EN 13001 *Cranes – General design*. The application of this alternative concept is to be agreed with LR prior to commencing of the project.

5.8 Rope safety factors

5.8.4 For ST-C system types, where the OPTS ~~which are~~ is also used as a conventional offshore crane without personnel handling, the rope safety factor is to be evaluated as per *Ch 4, 3.9 Rope safety factors* of the *Code for Lifting Appliances in a Marine Environment*.

5.11 Fatigue design assessment

5.11.1 Fatigue calculations are to be carried out in accordance with a recognised National or International Standard (e.g. ISO 20332 *Cranes – Proof of competence of steel structures*, EN 13001 *Cranes – General design*). Other standards will be specially considered. The applied standard shall be agreed with LR.

5.11.4 The proof of fatigue strength shall be carried out for each critical and primary structural component of the OPTS and the fatigue strength specific resistance factors γ_{mf} (as required in ISO 20332 *Cranes – Proof of competence of steel structures* or EN 13001 *Cranes – General design*) shall be at least taken as those provided in *Table 1.5.2 Fatigue strength specific resistance factor* γ_{mf}.

Section 7
Machinery

7.1 General

7.1.4 Fatigue calculations of machinery items are to be carried out in accordance with a recognised National or International Standard (e.g. EN 13001 *Cranes – General design*, ISO 6336 *Calculation of load capacity of spur and helical gears*). Other standards will be specially considered. The applied standard shall be agreed with LR.

7.4 Linear actuators

7.4.3 Linear actuators, which contain a lead screw to arrange for axial movement of the rod, are to be considered for buckling both on the entire extended actuator and the ~~sole~~ lead screw part only.

7.6 Hydraulic fluid storage

7.6.2 The storage capacity for hydraulic fluids is to be sufficient to recharge the largest system on board plus normal usage during a typical mission. Storage capacity is to be sufficient for each type of hydraulic fluid used. Storage capability sufficient to handle the full capacity of the largest hydraulic system on board is also to be provided for ~~dirty~~ contaminated hydraulic fluids.

7.6.10 All tanks are to be designed such that all pump suctions remain below the lowest set oil level for all design trim and ~~list~~ heel conditions.

7.9 Pipes conveying hydraulic fluid

7.9.1 Piping systems for flammable hydraulic fluids are to be installed to avoid fluid spray or leakage onto hot surfaces, into machinery air intakes, or onto other sources of ignition such as electrical equipment. Pipe joints are to be kept to a minimum, and where provided are to be of a type, acceptable to LR. Pipes are to be led in well lit and readily visible positions.

Section 8
Functional requirements

8.1 General

8.1.4 The OPTS is further to be designed to cover the significant hazards as per ISO 12100 *Safety of machinery – General principles for design – Risk assessment and risk reduction* which are not dealt with in this Code. Moving or rotating parts shall not pose a mechanical hazard (e.g. crushing, shearing, cutting, etc.) to personnel to be transferred, the Operator or other persons.

8.1.5 For the design of the gangway particular attention is drawn to the torsional stiffness of the gangway structure forming an open U-shaped ~~gangway profiles~~ cross-sectional profile which will still have some torsional resistance. Such resistance can lead to external and internal forces which need to be considered.

8.9 Guard rails, handrails and stanchions

8.9.7 Gates shall be designed in compliance with a recognised National or International Standard (e.g. ISO ~~1412~~ 14122 *Safety of machinery – Permanent means of access to machinery*). In addition, gates shall be provided with a self-locking device that will restrain the gate from accidental opening.

8.11 Gangway

8.11.1 The gangway shall be designed in compliance with a recognised National or International Standard and ISO 5488~~,~~ *Ships and marine technology – Accommodation ladders* and ISO 7061 *Ships and marine technology – Aluminium shore gangways for seagoing vessels* shall be considered to be applied (as applicable). In case of conflict between ~~the National Standard and the International Standard~~ an applied recognised National or International Standard the requirements of this Code shall be applied.

8.11.10 During the personnel transfer operation the preferred angle of the gangway relative to the horizontal plane shall be °~~±10°~~within +10° and -10. The maximum personnel transfer operation gangway inclination shall be limited to be within +20° and -20°~~±20°~~. The application of other personnel transfer operation gangway angles will be specially considered.

8.13 Operator control station

8.13.3 The Operator’s cabin, if provided, shall further:
(b) as far as practicable, be made of fire-retardant or fire-resistant materials, to a recognised Code or standard, e.g. IMO ~~FTP Code~~ *International Code for the Application of Fire Test Procedures (2010 FTP Code),* etc.;

8.16 Redundancy of components

8.16.2 For the purposes of decreasing the probability of occurrence of harm and failure the concept of EN 13135 *Cranes - Safety - Design - Requirements for equipment*, clause~~,~~ 5.9 shall be applied. This can be achieved by the application of a risk coefficient or by duplication of components. The specification of an enhanced inspection and maintenance programme or an upgrade of the level of quality control alone is not considered to be sufficient as a risk reduction/mitigation measure.

8.16.3 The general principles and steps of risk reduction measures are described in ISO 12100 *Safety of machinery – General principles for design – Risk assessment and risk reduction*, clause 6.

8.16.4 The concept and application of risk coefficients is described in EN 13001-2 *Cranes – General design – Part 3-2: Limit states and proof of competence of wire ropes in reeving systems*, clause 4.3.2 and Annex D.

8.20 Motion monitoring

8.20.2 The compensated motion shall be continuously monitored and recorded by the control system throughout the transfer operation and at least for a period of ten minutes prior to transfer operations. Operational motions are inherently statistical, therefore an appropriate statistical method shall be applied to provide for safe transfer operations. The statistical method is to determine the probability of exceeding the operational motion limits provided in *Ch 1, 8.20 Motion monitoring 8.20.3* and *Ch 1, 8.20 Motion monitoring 8.20.4*, during a representative transfer period of a minimum of ten minutes. The captured motion data shall be analysed by the control system and an alarm sounded if the probability (evaluated by the statistical model/method) of exceeding any limit is greater than $P = 10^{-3}$, to indicate that personnel transfer shall be suspended until motions are back within the defined limits. The probability level of $P = 10^{-3}$ is applied as a minimum for acceptable risk with reference to LR’s ShipRight ~~*Design and Construction, Additional Design Procedures, Risk Based Designs (RBD)*, January 2018~~ Procedure for *Risk Based Certification (RBC).*

8.21 Personnel containment and baskets

8.21.1 Suspended baskets as part of the personnel handling functionality of the OPTS functioning as an offshore crane (*see Ch 1, 1.10 Terms and definitions 1.10.3*) shall be designed and certified for this purpose.

8.23 Dropped objects

8.23.4 Reference is made to ANSI/ISEA 121 *American National Standard for Dropped Object Prevention Solutions* for guidance.

8.24 Fire safety

8.24.1 The active and passive fire protection arrangements and design are to be in compliance with the requirements of the mothership, e.g. Chapters 8.3 and 9 of IMO ~~MODU Code~~ *Code for the Construction and Equipment of Mobile Offshore Drilling Units (2009 MODU Code)* and Chapter II-2 of IMO ~~SOLAS~~ *International Convention for the Safety of Life at Sea (SOLAS), 1974*, etc. as applicable to the mothership.

8.24.3 Further to the mothership’s stipulated requirements for active and passive fire protection arrangements, reference should also be made to any potential requirements of the OPTS interfaced with offshore hydrocarbon production and/or drilling installations, e.g. ISO 13702 *Petroleum and natural gas industries – Control and mitigation of fires and explosions on offshore production installations – Requirements and guidelines*, ISO 19353 *Safety of machinery – Fire prevention and fire protection*, etc. However, the intended position of the mothership and the planned location of the OPTS interface to the offshore installation is to be in a location outside the range of any credible accidental loads, e.g. explosion blast loads, fire, dropped objects, etc. This is considered to require particular attention for OPTS used with offshore hydrocarbon production and/or drilling installations.

8.24.4 For the aspects of fire protection of the control station the requirements of EN 13557 *Cranes – Controls and control stations* are to be satisfied.

8.25 Hazardous areas

8.25.2 The identification of hazardous situations shall be carried out as per the requirements of a recognised standard (IEC 60079-10-1 *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*, EN 1127-1 *Explosive atmospheres – Explosion prevention and protection – Part 1: Basic concepts and methodology*, etc.).

8.25.3 Electrical equipment shall be in compliance with the requirements as detailed in IEC 60079 *Explosive atmospheres* series of standards and IEC 60079-14 *Explosive atmospheres – Part 14: Electrical installations design, selection and erection* in particular.

8.25.4 Non-electrical equipment shall be in compliance with the requirements as detailed in ISO 80079-36 *Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres – Basic method and requirements*.

8.25.5 The use of the OPTS with an offshore installation and any potential hazardous regions associated with an offshore installation needs to be fully considered. For OPTS used with offshore hydrocarbon production and/or drilling installations, particular attention needs to be paid to the potential large hazardous zones associated with such installations. The hazardous zones associated with such hydrocarbon production and/or drilling installations should be in accordance with a recognised Standard, ~~(~~e.g.;

- EI (formerly IP) ~~Part 15~~ *Model code of safe practice – Part 15: Area classification for installations handling flammable fluids*,
- API RP 505 *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities, Classified as Class I, Zone 0, Zone 1, and Zone 2*,
- IEC 60092-502 *Electrical installations in ships – Part 502: Tankers – Special features*,
- IEC 61892-7 *Mobile and fixed offshore units – Electrical installations – Part 7: Hazardous areas*,
- IEC 60079-10-1 *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*,
- IMO ~~MODU Code 2009~~ *Code for the Construction and Equipment of Mobile Offshore Drilling Units (2009 MODU Code)*~~)~~.

or established through distribution modelling.

8.25.6
(a) equipment installed within enclosure with suitably sealed barriers and doors, with an adequate level of smoke integrity (i.e. 'A' or 'H' fire rated divisions, as per IMO ~~FTP Code~~ *International Code for the Application of Fire Test Procedures (2010 FTP Code)* or ~~MODU Code~~ IMO *Code for the Construction and Equipment of Mobile Offshore Drilling Units (2009 MODU Code)*) and gas tightness;
(b) rated gas dampers (gas tight to ISO 15138 *Petroleum and natural gas industries – Offshore production installations – Heating, ventilation and air-conditioning* stated requirements);

8.26 Winterisation

8.26.1 Systems which are specially designed to operate in arctic conditions ~~will be as per~~ shall comply with the requirements of this sub-Section.

8.26.6 *See also Ch 1, ~~5.1 General 5.1.2.(e~~ 1.4 Definitions 1.4.7~~)~~* of LR's *Rules for the Winterisation of Ships* for a definition of ice removal measures.

8.26.7 Means are to be provided for habitable working conditions in Operator cabins, where fitted, by providing internal space heating arrangements. Cabin windows are to be provided with heating arrangements to protect from the build-up of ice, *see Ch 1, 3.3 Equipment and components 3.3.1* of the *Rules for the Winterisation of Ships*. Ice removal measures are to be provided to protect against icing. Window wiper operating devices are to be arranged inside the ~~cab~~ cabin or to be provided with heating arrangements.

■ *Section 9*
Electrotechnical systems

9.3 Alarms and warnings

9.3.1 The OPTS shall initiate an alarm in at least, but not limited to, the following cases:
(d) detection of an overload by the overload detection system (unless design margins are as such that overload is prevented under all circumstances);

9.4 Active systems (ST-A or ST-H)

9.4.3 The alarm system is to be designed, as far as practicable, to function independently of control and safety systems such that a failure or malfunction in these systems will not prevent the alarm system from operating (*see Pt 6, Ch 1, 2.3 Alarm systems, general requirements 2.3.15* of the *Rules and Regulations for the Classification of Ships*). If no separate systems are used for alarms and controls a redundant system is required. Any failure in the control system shall not cause the loss of the related alarm functions.

Table 1.9.1 Definition of alert priority, signalling and resulting actions

Examples for alerts
• Loss of or insufficient main power supply

9.8 Security of automation and control systems

9.8.3 Refer to the following publications for guidance:
(a) LR's ShipRight *Procedure Linked Supporting Services, Procedure for the Assessment of Cyber Security for Ships and Ships Systems*;
(b) IEC 62443 *Security for industrial automation and control systems* series of standards, on how to secure information and communication technology aspects of industrial processes;
(c) ~~EN~~ ISO/IEC 27001~~: 2017~~ *Information technology – Security techniques – Information management systems – Requirements*, on how to keep information assets secure; and

■ *Section 10*
Risk assessment

10.2 Risk assessment procedure

10.2.1 The designer/manufacturer shall prepare a Safety Statement in compliance with LR's Shipright *Procedure* ~~*Design and Construction, Additional Design Procedures, Risk Based Designs (RBD)*~~ *Risk Based Certification (RBC)* process which, as a minimum, shall describe:

10.3 Hazards

10.3.1 In general, the generic list of hazards as given in ISO 12100 *Safety of machinery – General principles for design – Risk assessment and risk reduction*, Annex B shall be applied for the risk assessment.

10.3.2 Project, design and environmental specific hazards need to be taken into account in addition to the generic hazards of ISO 12100 *Safety of machinery – General principles for design – Risk assessment and risk reduction*.

■ *Section 11*
Quality assurance system

11.1 General

11.1.1 The appliance designer/manufacturer shall have a documented quality assurance system with a 'continuous improvement process' in place. The quality assurance system shall be in compliance with a recognised National or International Standard, e.g. ISO 9001 *Quality management systems – Requirements*.

■ *Section 12*
Materials and fabrication

12.1 General

12.1.2 Manufacturers of OPTS and components shall have a suitable quality management (QM) system as per the requirements of ISO 9001 *Quality management systems – Requirements* in place. The manufacturer's QM system shall be certified by an accredited certification body.

12.2 Material selection

12.2.5 Carbon steel bolts are to be specified in accordance with ISO 898 ~~part 1~~ *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs with specified property classes – Coarse thread and fine pitch thread*. Bolts are to be selected within the range 8.8 to 10.9 (inclusive). Bolt materials in other materials such as stainless steels are to be specified in accordance with a recognised National or International Standard. The required level of certification for bolts is given in *Ch 1, 12.8 Documentation*.

12.2.8 A suitable corrosion protection system is to be selected and applied by the designer/manufacturer depending on the expected corrosivity environment. If a protective paint system has been selected it shall comply with the requirements of the applicable parts of ISO 12944 *Paints and varnishes – Corrosion protection of steel structures by protective paint systems*. If there is no corrosivity category agreed between the Owner/Operator and the designer/manufacturer the corrosivity category 'CX' as defined in ISO 12944 *Paints and varnishes – Corrosion protection of steel structures by protective paint systems* shall be selected. All items and areas are to be sufficiently protected against corrosion for the agreed protection duration of the system. If there is no protection duration agreed between the Owner/Operator and the designer/manufacturer the durability range 'H' (as a minimum) as defined in ISO 12944 *Paints and varnishes – Corrosion protection of steel structures by protective paint systems* shall be

selected. If the system is to be operated beyond the agreed protection duration or the duration of the durability range of ISO 12944 *Paints and varnishes – Corrosion protection of steel structures by protective paint systems*, additional maintenance inspections are to be carried out and appropriate defect criteria are to be defined in the maintenance section of the instruction for use.

12.4 'Z' grade steel

12.4.2 Where Z grade steel is specified the requirements of ~~*Ch 8 Aluminium Alloys*~~ *Ch 3, 8 Plates with specified through thickness properties* of the *Rules for the Manufacture, Testing and Certification of Materials*, shall be met and, if necessary, supplementary guidance on selection of Z25 or Z35 may be obtained from a recognised National or International Standard acceptable to LR to ensure structural integrity of the proposed design.

12.6 Fabrication

12.6.6 Any classification and acceptance criteria of weld imperfections shall be in accordance with ISO 5817 *Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections*.

Table 1.12.2 Weld quality levels

Note The quality levels are defined in ISO 5817 *Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections*.

12.6.8 Concerning welds subject to fatigue, reference is made to Annex C of ISO 5817 *Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections*.

■ *Section 13*
Testing, marking and surveys

13.1 Testing

13.1.6 For A-GU type systems (providing unrestricted access) the initial overload tests and subsequent periodical overload tests are to be carried out using the test loads as defined in the following:

(a) A-GU gangway integrity test

The test load shall be applied uniformly along the completely extended gangway with the test load per square metre defined as follows:

~~$TL_{AG-U.a} = F_T\ UDL_P$~~

$TL_{A\text{-}GU.a} = F_T\ UDL_P$

where

~~$TL_{AG-U.a}$ = test load, in kg/m²~~

$TL_{A\text{-}GU.a}$ = test load, in kg/m²

~~(b)~~ F_T = 1,25 = test load factor

UDL_P = 410 kg/m²

This integrity test is only required at the initial survey; the test may be carried out at the manufacturer's works and does not need to be repeated on board.

(b)~~(c)~~ A-GU system test

(i) For A-GU type systems which are not designed to carry personnel in the cantilevered position, the test load is to be applied uniformly along the completely extended gangway with the test load per square metre defined as follows:

$$\cancel{TL_{\mathrm{AG-U.b.i\,1}} = \frac{(F_T - 1)\,W_{gw}}{L_{gw} B_{gw}}}$$

$$TL_{\mathrm{A-GU.b.i1}} = \frac{(F_{\mathrm{T}} - 1)\,W_{gw}}{L_{gw}\,B_{gw}}$$

where

~~$TL_{\mathrm{AG-U.b.i.1}}$ = test load, in kg/m²~~

$TL_{\mathrm{A-GU.b.i1}}$ = test load, in kg/m²

$g = 9{,}81$ kg/m²

W_{gw}= total dead load of the gangway, in kg

L_{gw}= length of gangway from heel to tip, in m

B_{gw}= effective width of gangway

(*see Ch 1, 1.10 Terms and definitions 1.10.8* for a definition of the effective width), in m

Alternatively, the test load may be applied at the gangway tip and is defined as follows:

$$\cancel{TL_{\mathrm{AG-U.b.i.2}} = (F_T - 1)\,W_{gw}\,\frac{1}{2}}$$

$$TL_{\mathrm{A-GU.b.i2}} = (F_{\mathrm{T}} - 1)\,W_{gw}\,\frac{1}{2}$$

where

~~$TL_{\mathrm{AG-U.b.i.2}}$ = alternative test load, in kg~~

$TL_{\mathrm{A-GU.b.i2}}$ = alternative test load, in kg

The designer/manufacturer needs to evaluate whether it can be ensured that the gangway cannot be used in the cantilevered position. If this cannot be ensured the system needs to be designed and tested as a cantilevered system as defined in ~~*Ch 1, 13.1 Testing, 13.1.6.(c).(i)*~~*Ch 1, 13.1 Testing 13.1.6.(b).(ii)*

(ii) For A-GU type systems which are designed to carry personnel in the cantilevered position, the test loads are to be applied at the gangway tip and are defined as follows:

$$\cancel{TL_{\mathrm{AG-U.b.ii.1}} = W_{gw}\left(\frac{F_T - 1}{2}\right) + F_T\,UDL_P\,L_{gw}\,B_{gw}\,\frac{1}{2}}$$

$$TL_{\mathrm{A-GU.b.ii1}} = W_{gw}\left(\frac{F_{\mathrm{T}} - 1}{2}\right) + F_{\mathrm{T}}\,UDL_{\mathrm{P}}\,L_{gw}\,B_{gw}\,\frac{1}{2}$$

where

~~$TL_{\mathrm{AG-U.b.ii.1}}$ = test load, in kg~~

$TL_{\mathrm{AG-U.b.ii1}}$ = test load, in kg

Alternatively, the test loads may be applied uniformly along the completely extended gangway with the test load per square metre defined as follows:

$$\cancel{TL_{\mathrm{AG-U.b.ii2}} = \frac{(F_{\mathrm{T}}-1)\,W_{\mathrm{gw}}}{L_{\mathrm{gw}}B_{\mathrm{gw}}} + F_{\mathrm{T}}\,UDL_{\mathrm{P}}L_{\mathrm{gw}}\,B_{\mathrm{gw}}\,\frac{1}{2}}$$

$$TL_{\mathrm{A-GU.b.ii2}} = \frac{(F_{\mathrm{T}}-1)\,W_{\mathrm{gw}}}{L_{\mathrm{gw}}\,B_{\mathrm{gw}}} + F_{\mathrm{T}}\,UDL_{\mathrm{P}}$$

where

~~$TL_{\mathrm{AG-U.b.ii.2}}$ = alternative test load, in $\frac{\mathrm{kg}}{\mathrm{m}^2}$~~

$TL_{\mathrm{A-GU.b.ii2}}$ = alternative test load, in $\frac{\mathrm{kg}}{\mathrm{m}^2}$

If the test load ~~$TL_{\mathrm{AG-U.b.ii.2}}$~~ $TL_{\mathrm{A-GU.b.ii2}}$ is chosen to be applied along the completely extended gangway, the test as defined in *Ch 1, 13.1 Testing, 13.1.6.(a)* may be omitted.

The gangway shall be in the cantilevered position in both cases (i) and (ii) during the overload test.

13.2 Marking

13.2.2 Each OPTS is to be clearly and permanently marked at the Operator's control station with a minimum of the following information:
(m) with the mark of the Surveyor who ~~carried out~~ witnessed the load and functional testing.

13.2.5 The marking language shall preferably be the English language. Alternatively, and depending on the requirements of the Flag or Coastal State Authorities, the language may, in addition, be that of the mothership's crew.

13.2.8 The OPTS parts, components, machinery items, shall be marked with visual danger signs in accordance with a recognised National ~~of~~ or International Standard (e.g. EN 842 *Safety of machinery - Visual danger signals - General requirements, design and testing* or ISO 7010 *Graphical symbols – Safety colours and safety signs – Registered safety signs* as considered appropriate), as applicable.

13.5 Periodical thorough examinations

Table 1.13.1 6-Monthly thorough examination of OPTS

Item	Survey
2. Arrangements	Check reeving arrangement are as shown in Rigging Plan or designer's/manufacturer's manual. Check that the arrangement of hydraulic cylinders (if applicable) is as shown on the reeving diagram or appropriate plans.
4.~~Walkway~~ Gangway heel pins and other pins in the main load-path	
5. Slewing rings for OPTS	(c) Check condition and tightness (~~with a torque wrench~~ using a method recommended by the manufacturer) of inner and outer bearing bolts, removing any protective caps if fitted. Sample bolts may be removed at the discretion of the Surveyor to check for the possibility of stress corrosion cracking.
6. Wire ropes	(a) Confirm that appropriate wire ropes certificates are on board (LA.4 or equivalent). (c) Check for broken or worn wires. Check for any signs of internal and external corrosion. Check for changes in rope diameter. Check for signs of damage and deformation (e.g. kinks, birdcaging, etc.), or of thermal damage. In general, the rope is to be replaced immediately, if any of the discard criteria in ISO 4309 *Cranes – Wire ropes – Care and maintenance, inspection and discard* are exceeded.
7. Structure and general	(d) Check welds between pedestal/foundation and the mothership. Initially by visual examination but NDE can be used at the Surveyor's discretion. (e) Inspect the structure for condition of coating. Inspect the structure for corrosion, removing paint and carrying out hammer tests as necessary. If considered necessary, the thickness of structural items is to be checked by ultrasonic testing or other ~~approved method~~ suitable methods that do not affect the material or condition of the structure. (f) Check base frame, gangway, walkways, guard rails, handrails, stanchions, ~~support~~ supporting pedestal (or foundation), for any signs of damages, local indentations, buckling, cracks or unfairness. Particular attention is to be given to connections of chords and lattices, hydraulic cylinder connections, sheave housing attachments, gangway tip, and other areas where there is significant load input.
8. Shackles, links, rings, etc.	(c) Confirm that the material is recorded on the test certificate. The certificate should distinguish between mild steel, higher tensile steel and alloy steel.
9. Chains	(c) Check for deformation, wear or other defects. If links require renewal, the chain is to be suitably heat treated and re-tested. Replacement links are to be of equivalent material and strength to the original.
11. Hydraulic arrangements	(d) Check ~~of~~ pre-fill pressure of the hydrogen bottles, as applicable.

12. Hydraulic cylinders, winches, etc. and attachments	(f) ~~Safety~~ Check safety systems, such as limit switches and slack rope detection systems.
13. Electrical and control arrangements	(d) Check effectiveness of limit switches.

■ *Section 14*
Documentation

14.2 Certificates for certification

14.2.3 For certification of OPTS the following certificates will be issued following satisfactory completion of all the conditions required for the issue of certification by LR. *See Ch 13 Documentation*, *Table 13.1.1 Certificates for certification* of the *Code for Lifting Appliances in a Marine Environment*:
(a) LA.1 (Form 1365) – Register of Ship's Lifting Appliances and Cargo Handling Gear;
(b) LA.2OPTS (Form 1386) – Certificate of Test and Thorough Examination of Offshore Personnel Transfer Systems;
(c) LA.3 (Form 1382) – Certificate of Test and Thorough Examination of Loose Gear before being taken into use, and of such gear after it has been altered or required (as applicable and required);
(d) LA.4 (Form 1383) – Certificate of Test and Thorough Examination of Wire Rope, before being taken into use (as applicable and required); and
(e) LA.5 (Form 1384) – Certificate of Test and Thorough Examination of Fibre Rope, before being taken into use (as applicable and appropriate).

Refer to process steps 3, 6 and 7 as defined in *Ch 13 Documentation*, *Table 13.2.1 Minimum requirements for the certification of lifting appliances* or *Table 13.3.1 Minimum requirements for the classification of lifting appliances* of the *Code for Lifting Appliances in a Marine Environment*.

Chapter 2
Annex Recommendations for Safe Operation of the OPTS

■ *Section 3*
Operational aspects

3.2 Safety equipment

3.2.4 Signs reminding personnel to wear the required PPE ~~are to~~ should be fitted.

3.4 Operators and transferring personnel

3.4.1 The Operator ~~is to~~ should be qualified, trained and certified before operating the OPTS in accordance with the instructions from the manufacturer and/or requirements of the National Authority (i.e. Flag State) and/or Coastal State Authorities.

3.4.2 The transferring personnel ~~are to~~ should be properly instructed prior to any commencing transfer operation.

3.5 Environmental aspects

3.5.1 The maximum wind speed during any personnel transfer operations ~~shall~~ should be limited to 15 m/s. Higher wind speeds will be specially considered. Reference is to be made to *Ch 2, 4.1 Pre-use risk assessment* on operational aspects for the use of the OPTS in high winds.

3.5.3 Signs reminding personnel to remove any accretion of ice and snow ~~are to~~ should be fitted.

■ *Section 4*
Activities prior to use

4.1 Pre-use risk assessment

4.1.1 A risk assessment should be carried out prior to every use in relation to hazards associated with the following:
(e) potential mothership inclinations (heel, trim);
Existing listed item (e) has been renumbered (f)
(g) (h) suitable condition of the OPTS and associated and/or remote equipment, e.g.
(i) state of OPTS in general and its components;
(ii) status of indicating devices and warning messages signalling the state of the OPTS (e.g. wind speeds, state of hydraulic system, state of power supply, state of control system, etc.);

4.3 Pre-use inspection

4.3.2 For fully passive OPTS (e.g. systems bridging a 'Floatel' and an FPSO) or dual mode systems which are in passive mode for a long time (e.g. more than a day) the inspection should be carried out daily prior to each consecutive use. The inspection/ examination should be documented and made available if necessary.

■ *Section 5*
Miscellaneous aspects

5.1 Integration

5.1.1 Before the OPTS is installed on an actual mothership it ~~is to~~ should be ensured that the accelerations of the actual mothership are within the design load envelope.

5.2 Target structure

5.2.2 It ~~is to~~ should be ensured that the OPTS gangway tip or personnel containment is functionally and structurally compatible with the target structure.

5.3 Stowage

5.3.4 Depending on the OPTS type and design it may be acceptable for in-field-transit that a less strict securing regime is applied. For example, it might be acceptable that the gangway is only supported by the luffing systems and the gangway slewing is arrested by drive brakes for in-field-transit cases. However, in such cases it ~~is to~~ should be ensured that proper weather window information is obtained in order to ensure that the design loads for the system are not exceeded and/or hazardous situations, such as uncontrolled gangway movements, are avoided in all cases.

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